

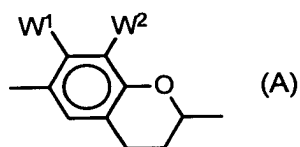
CLAIMS

1. A liquid crystal display element:

having a structure comprising a pair of substrates, and a liquid crystal composition sandwiched between the substrates;

comprising at least an alignment control layer, a transparent electrode, and a polarizing plate; and

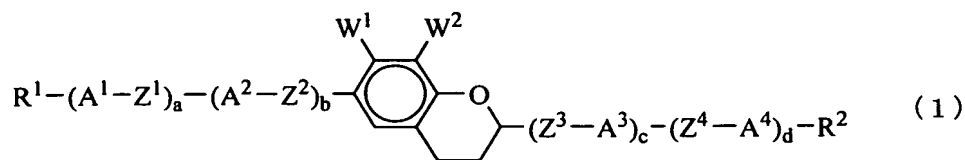
characterized in that the liquid crystal composition comprises at least one liquid crystal compound having a partial structure represented by general formula (A):



(wherein W¹ and W² each independently represents fluorine, chlorine, -CF₃, -CF₂H, -OCF₃, or -OCF₂H) and has a negative dielectric anisotropy.

2. A liquid crystal display element according to claim 1, wherein W¹ and W² represent fluorine.

3. A compound represented by general formula (1):



(wherein

R^1 and R^2 each independently represents hydrogen, an alkyl group having 1 to 12 carbon atoms or an alkenyl group having 2 to 12 carbon atoms, in which one CH_2 group or at least two CH_2 groups that are not adjacent to each other may be substituted by oxygen or sulfur, or in which at least one hydrogen may be substituted by fluorine or chlorine,

A^1 , A^2 , A^3 , and A^4 each independently represents a trans-1,4-cyclohexylene group (in which one CH_2 group or two CH_2 groups that are not adjacent to each other may be substituted by oxygen or sulfur), a 1,4-phenylene group (in which at least one CH group may be substituted by nitrogen), a 1,4-cyclohexenylene group, a 1,4-bicyclo[2.2.2]octylene group, a piperidine-1,4-diyl group, a naphthalene-2,6-diyl group, a decahydronaphthalene-2,6-diyl group or a 1,2,3,4-tetrahydronaphthalene-2,6-diyl group, in which hydrogen may be substituted by -CN or halogen,

Z^1 , Z^2 , Z^3 , and Z^4 each independently represents $-\text{CH}_2\text{CH}_2-$, $-\text{CH}=\text{CH}-$, $-\text{CH}(\text{CH}_3)\text{CH}_2-$, $-\text{CH}_2\text{CH}(\text{CH}_3)-$, $-\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_3)-$, $-\text{CF}_2\text{CF}_2-$, $-\text{CF}=\text{CF}-$, $-\text{CH}_2\text{O}-$, $-\text{OCH}_2-$, $-\text{OCH}(\text{CH}_3)-$, $-\text{CH}(\text{CH}_3)\text{O}-$, $-(\text{CH}_2)_4-$, $-(\text{CH}_2)_3\text{O}-$, $-\text{O}(\text{CH}_2)_3-$, $-\text{C}\equiv\text{C}-$, $-\text{CF}_2\text{O}-$,

-OCF₂-, -COO-, -OCO-, -COS-, -SCO-, or a single bond,

when A¹, A², A³, A⁴, Z¹, Z², Z³, and Z⁴ respectively exist in plural, they may be identical to each other or different from each other,

a, b, c, and d each independently represents 0 or 1, and

W¹ and W² each independently represents fluorine, chlorine, -CF₃, -CF₂H, -OCF₃, or -OCF₂H).

4. A compound according to claim 3, wherein in the general formula (1) R¹ and R² each independently represents an alkyl group having 1 to 7 carbon atoms or an alkenyl group having 2 to 7 carbon atoms (in which one CH₂ group may be substituted by oxygen), and W¹ and W² represent fluorine.
5. A compound according to claim 3, wherein in the general formula (1) A¹, A², A³ and A⁴ each independently represents a trans1,4-cyclohexylene group, a 1,4-phenylene group which may be substituted by at least one fluorine, or a 1,4-bicyclo[2.2.2]octylene group.
6. A compound according to claim 3, wherein in the general formula (1) Z¹, Z², Z³, and Z⁴ each independently represents -CH₂CH₂-, -CH=CH-, -CF₂CF₂-, -CF=CF-, -CH₂O-,

-OCH₂-, -C≡C-, -CF₂O-, -OCF₂- or a single bond.

7. A compound according to claim 3, wherein in the general formula (1) the sum of a, b, c, and d is 1 or 2.

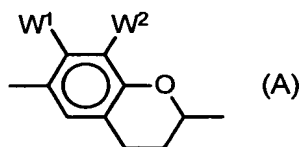
8. A compound according to claim 3, wherein in the general formula (1) R¹ and R² each independently represents an alkyl group having 1 to 7 carbon atoms or an alkenyl group having 2 to 7 carbon atoms (in which a CH₂ group may be substituted by oxygen), W¹ and W² represent fluorine, A¹, A², A³, and A⁴ each independently represents a trans-1,4-cyclohexylene group, a 1,4-phenylene group which may be substituted by at least one fluorine, or a 1,4-bicyclo[2.2.2]octylene group, Z¹, Z², Z³ and Z⁴ each independently represents -CH₂CH₂-, -CH=CH-, -CF₂CF₂-, -CF=CF-, -CH₂O-, -OCH₂-, -C≡C-, -CF₂O-, -OCF₂-, or a single bond, and the sum of a, b, c, and d is 1 or 2.

9. A compound according to claim 3, wherein in the general formula (1) R¹ and R² each independently represents an alkyl group having 1 to 7 carbon atoms, an alkenyl group having 2 to 7 carbon atoms, or an alkoxyl group having 1 to 7 carbon atoms, A¹, A², A³, and A⁴ each independently represents a trans-1,4-cyclohexylene group, a 1,4-phenylene group, a 2-fluoro-1,4-phenylene group, a 3-fluoro-1,4-phenylene group, or

a 2,3-difluoro-1,4-phenylene group, Z^1 , Z^2 , Z^3 , and Z^4 each independently represents $-\text{CH}_2\text{CH}_2-$, $-\text{CH}_2\text{O}-$, $-\text{OCH}_2-$, or a single bond, W^1 and W^2 represent fluorine, and the sum of a, b, c, and d is 1 or 2.

10. A compound according to claim 9, wherein in the general formula (1) A^1 , A^2 , A^3 , and A^4 each independently represents a trans-1,4-cyclohexylene group or a 1,4-phenylene group.

11. A liquid crystal compound which can be used in the liquid crystal display element according to claim 1, comprising a partial structure represented by general formula (A):

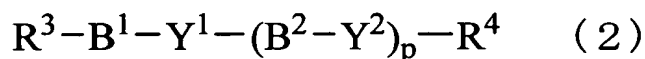


(wherein W^1 and W^2 each independently represents fluorine, chlorine, $-\text{CF}_3$, $-\text{CF}_2\text{H}$, $-\text{OCF}_3$, or $-\text{OCF}_2\text{H}$).

12. A liquid crystal compound according to claim 11, which can be used in the liquid crystal display element according to claim 1, wherein in the general formula (A) W^1 and W^2 represent fluorine.

13. A liquid crystal composition comprising at least one liquid crystal compound according to claim 11.

14. A compound represented by general formula (2):



(wherein,

R^3 and R^4 each independently represents hydrogen, an alkyl group having 1 to 12 carbon atoms or an alkenyl group having 2 to 12 carbon atoms, in which one CH_2 group or at least two CH_2 groups that are not adjacent to each other may be substituted by oxygen or sulfur, or in which at least one hydrogen may be substituted by fluorine or chlorine,

B^1 and B^2 each independently represents a trans-1,4-cyclohexylene group (in which one CH_2 group or two CH_2 groups that are not adjacent to each other may be substituted by oxygen or sulfur), a 1,4-phenylene group (in which at least one CH group may be substituted by nitrogen), a 1,4-cyclohexenylene group, a 1,4-bicyclo[2.2.2]octylene group, a piperidine-1,4-diyl group, a naphthalene-2,6-diyl group, a decahydronaphthalene-2,6-diyl group or a 1,2,3,4-tetrahydronaphthalene-2,6-diyl group, in which hydrogen may be substituted by

-CN or halogen,

Y^1 and Y^2 each independently represents $-CH_2CH_2-$, $-CH=CH-$, $-CH(CH_3)CH_2-$,
 $-CH_2CH(CH_3)-$, $-CH(CH_3)CH(CH_3)-$, $-CF_2CF_2-$, $-CF=CF-$, $-CH_2O-$, $-OCH_2-$,
 $-OCH(CH_3)-$, $-CH(CH_3)O-$, $-(CH_2)_4-$, $-(CH_2)_3O-$, $-O(CH_2)_3-$, $-C\equiv C-$, $-CF_2O-$, $-OCF_2-$,
 $-COO-$, $-OCO-$, $-COS-$, $-SCO-$, or a single bond,

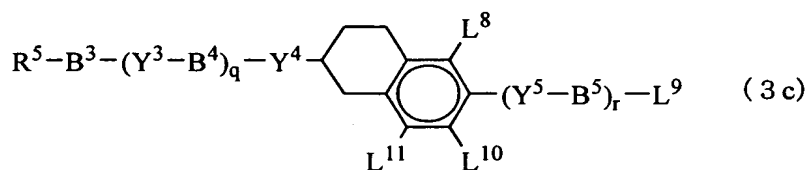
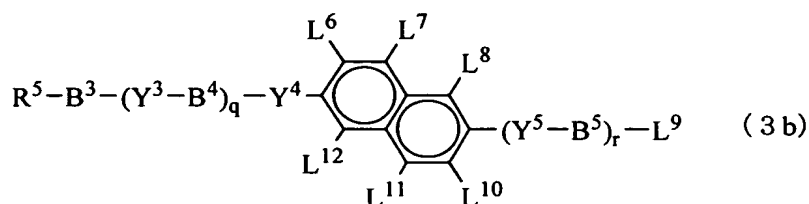
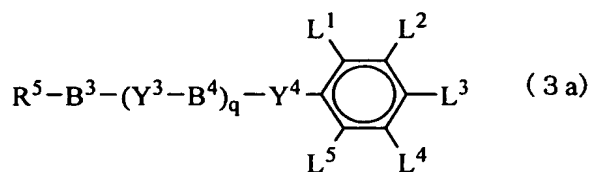
when Y^2 and B^2 respectively exist in plural, they may be identical to each other
 or different from each other, and

p represents 0, 1 or 2).

15. A liquid crystal compound which can be used in the liquid crystal display element according to claim 1, comprising at least one liquid crystal compound according to claim 14.

16. A liquid crystal composition according to claim 13, comprising at least one liquid crystal compound according to claim 14.

17. A liquid crystal composition according to claim 13, comprising at least one compound selected from the group consisting of general formula (3a), general formula (3b), and general formula (3c):



(wherein

R^5 represents hydrogen, an alkyl group having 1 to 12 carbon atoms or an alkenyl group having 2 to 12 carbon atoms, in which one CH_2 group or at least two CH_2 groups that are not adjacent to each other may be substituted by oxygen or sulfur, or in which at least one hydrogen may be substituted by fluorine or chlorine,

B^3 , B^4 , and B^5 each independently represents a trans-1,4-cyclohexylene group (in which one CH_2 group or two CH_2 groups that are not adjacent to each other may be substituted by oxygen or sulfur), a 1,4-phenylene group (in which at least one CH group may be substituted by nitrogen), a 1,4-cyclohexenylene group, a 1,4-bicyclo[2.2.2]octylene group, a piperidine-1,4-diyl group, a naphthalene-2,6-diyl group, a decahydronaphthalene-2,6-diyl group or a 1,2,3,4-tetrahydronaphthalene-2,6-diyl group, in which hydrogen may be substituted by

-CN or halogen,

Y^3 , Y^4 , and Y^5 each independently represents $-CH_2CH_2-$, $-CH=CH-$,
 $-CH(CH_3)CH_2-$, $-CH_2CH(CH_3)-$, $-CH(CH_3)CH(CH_3)-$, $-CF_2CF_2-$, $-CF=CF-$, $-CH_2O-$,
 $-OCH_2-$, $-OCH(CH_3)-$, $-CH(CH_3)O-$, $-(CH_2)_4-$, $-(CH_2)_3O-$, $-O(CH_2)_3-$, $-C\equiv C-$, $-CF_2O-$,
 $-OCF_2-$, $-COO-$, $-OCO-$, $-COS-$, $-SCO-$, or a single bond,

L^1 , L^2 , L^4 , L^5 , L^6 , L^7 , L^8 , L^{10} , L^{11} , and L^{12} each independently represents
hydrogen or fluorine,

q and r each independently represents 0, 1, or 2, provided that the sum of q and r
is no more than 2, and

L^3 and L^9 each independently represents hydrogen, fluorine, chlorine, $-CN$, $-CF_3$,
 $-OCH_2F$, $-OCHF_2$, $-OCF_3$, $-CH_2CF_3$, or the same meaning as R^5).

18. A liquid crystal composition according to claim 13, wherein a content ratio of
the liquid crystal compound according to claim 11 is 2 to 30% by mass.

19. A liquid crystal composition according to claim 13, wherein a dielectric
anisotropy value is no more than -0.2.

20. A liquid crystal display element according to claim 1, wherein its drive system is

an active matrix system.

21. A liquid crystal display element according to claim 1, wherein a liquid crystal alignment regulated by the alignment control layer is vertical to a surface of the substrate.